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Forest Health Protection

Pacific Southwest Region
Northeastern California Shared Service Area

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To: District Ranger, Hat Creek Ranger District, Lassen National Forest

Subject: Considerations for fire-injured tree harvest and hazard tree abatement within the 2012 Reading Fire (FHP Report NE12-06)

At the request of Matt Staudacher and Alissa Tanner, Silviculturists, Hat Creek Ranger District, Danny Cluck, Forest Health Protection (FHP) Entomologist, visited the Reading Fire with district staff on September 25, 2012. The objective of this visit was to evaluate the levels of fire injury to conifers, note any insect activity and discuss variables that should be considered when developing fire-injured tree and hazard tree marking guidelines. Recommendations provided in this report will assist in the formulation of silvicultural prescriptions aimed removing a portion of the fire-injured trees and abatement of roadside hazard trees.

Description of the project area

The 2012 Reading Fire is located on the Lassen National Forest approximately 10 miles southwest of Old Station, CA, and south of Highway 44 (T31/32N, R4/5E). The elevation ranges from 5,200 – 7,800 feet with annual precipitation between 20 and 45 inches. Forested areas are a drier mixed conifer type with white fir (*Abies concolor*) being the dominant species. Jeffrey pine (*Pinus jeffreyi*), ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta var. murrayana*), sugar pine (*Pinus lambertiana*), red fir (*Abies magnifica*) and incense cedar (*Calocedrus decurrens*) are all present in lower numbers. Yellow pines are found mostly in the mid and overstory layers as regeneration is limited by dense canopy cover. Much of the area was also previously logged resulting in the removal of many overstory pines. This harvest activity combined with fire suppression has resulted in the current white fir dominated stand conditions. Most of the burned area was included in a developing project aimed at restoring stands to a fire-adapted and resilient state by creating age, structural and species diversity.

General observations

- Several locations had high numbers of green crowned white fir with severe bole scorching

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leading to significant cambium kill.

- Pockets of white boring dust created by ambrosia beetle attacks were common on scorched white fir boles.
- Jeffrey/ponderosa pine also sustained bole injuries in many areas but ambrosia beetle and red turpentine beetle activity was uncommon on these species.
- Woodboring beetle larvae were observed in severely bole scorched lodgepole pines.
- Some crown-scorched Jeffrey/ponderosa pines appeared to continue needle elongation post-fire but this was not consistent enough to use in a marking guideline (see marking guideline considerations below).
- Pre-fire Jeffrey pine beetle, mountain pine beetle and fir engraver beetle activity, as evidenced by the presence of pitch tubes or crown fade (not fire related), was observed in the general area in both burned and unburned trees.
- White fir in this area appears to have a long history of elevated mortality and top-kill caused by fir engraver beetle during periods of drought based on the high number of top-killed, dead and downed trees.
- Most unburned and low severity burned stands continue to be in an overstocked condition contributing to moisture stress and elevated bark beetle activity.

Pre-fire bark beetle activity

FHP aerial detection surveys mapped mortality within and adjacent to the Reading Fire area in 2011 and in adjacent areas in 2012. Bark beetle activity was elevated for both years with mostly fir engraver beetle (*Scolytus ventralis*)-caused mortality of white fir mapped in 2011 and western pine beetle (*Dendroctonus brevicomis*)-caused mortality of ponderosa pine in 2012. Other mapped bark beetle-caused mortality included mountain pine beetle (*Dendroctonus ponderosae*)-killed lodgepole pine and sugar pine and Jeffrey pine beetle (*Dendroctonus jeffreyi*)-killed Jeffrey pine.

Post-fire bark beetle activity

The amount of post-fire insect activity and the resulting tree mortality depends on many factors such as the timing of the fire, the level of insect activity in the area prior to the fire, stand characteristics and precipitation. For the Reading Fire, most bark beetle activity in fire-injured trees will begin in the spring of 2013 with more woodborer activity occurring later in the summer. Bark beetle populations are elevated in the area so higher than normal activity should be anticipated in fire-injured trees. Activity may greater if dry conditions continue into next year. This prediction is not limited to fire-injured trees as continued elevated bark beetle activity is also expected in surrounding areas due to overstocked stand conditions (not related to the fire).

The level of fire-injury on an individual tree also plays a role in post-fire insect activity. Fire damaged trees can be placed into three categories: 1) those killed outright or so severely injured by the fire that they will soon die, 2) those that are uninjured or lightly injured and should survive, and 3) those in between, the moderately injured trees. Bark beetles will attack trees in all three categories but successful brood production will only occur in trees with moist cambium. Trees in category one typically do not have enough moist cambium after the fire or if they do, it will become either resin soaked or dry out before beetles can complete their development. Furthermore, trees that are mostly consumed during the fire are less likely to be attacked by bark beetles. Trees

in category two provide the highest level of suitable cambium for bark beetles but typically are not injured to the extent that their defenses are compromised. These trees still have the ability to pitch out beetles as they attack, or more often, are avoided by bark beetles altogether. The highest level of bark beetle attacks are likely to occur on trees in category three, the moderately injured trees. These trees will have moderate to high levels of crown scorch and cambium injury that compromise their defense systems and put them at a higher probability of mortality based on injury alone. These trees can also provide ideal habitat for bark beetles, especially if cambium injuries are concentrated on the lower bole or at the root collar. Woodboring beetles are likely to attack and successfully reproduce in both moderate and severely injured trees but since these types of beetles typically attack only dead and dying trees, they are not a threat to healthy trees within or adjacent to the burned areas.

Additional tree mortality within the Reading Fire should be expected over the next three to five years. Mortality will likely occur from fire injuries alone, in the case of severely injured trees, or from a combination of fire injuries and bark beetle attacks, in the case of moderately injured trees. The highest mortality levels are expected to occur in the moderate and high vegetation severity areas with scattered mortality in the low vegetation severity areas (refer to Vegetation Severity maps). Bark beetle activity in fire-injured trees is not likely to result in a population buildup that will subsequently spread into adjacent unburned stands at a significant level. Based on past observations of fires in California by FHP personnel, the buildup of bark beetles within burned areas has rarely resulted in increased attacks in adjacent unburned stands. When this has occurred, mortality has been restricted to individual trees and small stands that were directly adjacent to the fire perimeter and were generally in an unhealthy condition due to overstocking and drought. A recent and local example of this is the western pine beetle-caused mortality of ponderosa pines that are growing along the edge of the 2008 Sugarloaf Fire perimeter.

Considerations for fire-injured tree marking guidelines

The guidelines developed by Region 5 FHP, *Marking guidelines for fire-injured trees in California* (Smith and Cluck 2011) are appropriate for use in the Reading Fire. The following factors should be considered when selecting the probability of mortality(s) for tree removal:

- the potential for elevated post-fire bark beetle activity in all tree species (except for incense cedar)
- the current drier than normal conditions leading to increased moisture stress
- the overstocked condition of many of the low burn severity stands
- the high level of cambium kill observed in many stands, especially white fir
- the long-term goal of creating resiliency by shifting species composition from shade tolerant white fir to more shade intolerant pine species
- the need to limit the number of fire-injured trees along roadsides that have a high probability of mortality
- the need to meet post-fire fuels objectives
- the need to meet reforestation objectives

Since the Lassen NF portion of the Reading Fire burned later in the growing season, Jeffrey and ponderosa pines had mostly finished needle growth by the time their crowns were scorched.

Therefore, the crown scorch guideline for yellow pine (pre-bud break) should be used to mark these species at this time. If tree marking continues next spring/summer, the crown kill guideline for yellow pine (post-bud break) should be used as soon as new growth is clearly visible throughout the crown.

The boring dust created by ambrosia beetles that was observed on many of the bole scorched white fir should be considered as evidence of significant wood boring beetle activity if the pockets of dust are evenly distributed over at least 1/3 of the bole circumference. The boring dust is highly visible at this time but could be washed/blown off over the winter. Therefore, white fir areas should be marked as soon as possible to take full advantage of this useful indicator.

Considerations for hazard trees

Region 5 FHP has recently developed new hazard tree guidelines (Angwin et al 2012). These guidelines more clearly define failure and target potential to help land managers make more informed decisions for hazard tree abatement projects. In using these guidelines for roadside hazards, the district will need to decide which trees need to be removed based on the failure potential rating of any defect(s) found and the "Exposure Duration" (Long, Short or Intermittent With High Frequency), which reflects such factors as road maintenance level, traffic volume, and degree to which people stop and congregate.

Please keep in mind that the FHP hazard tree and fire-injured tree guidelines are addressing different subjects. The fire-injured tree marking guidelines are predicting tree mortality, not failure potential. Likewise, the hazard tree guidelines predict tree failure potential and not tree mortality. Both can be used along roadsides to abate existing tree hazards due to defect and remove trees that are likely to die and pose a hazard in the near future. Both guidelines have been provided to the Hat Creek Ranger District.

If you have any questions regarding this report and/or need additional information please contact Danny Cluck at 530-252-6431.

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References:

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